AN

EXPERIMENTAL INQUIRY

INTO THE

STRUCTURE AND FUNCTION

OF

THE SPLEEN.

By WILLIAM DOBSON.

London:
PRINTED FOR
JOHN WILSON, 16, PRINCES STREET, SOHO.

1830.

Goyder, Printer, 11, Dartmouth Street, Westminster.

TO

CHARLES TURNER THACKRAH, Esq.

MEMBER OF THE ROYAL COLLEGE OF SURGEONS

OF LONDON,

OF THE

SOCIETE DE MEDECINE-PRATIQUE

DE PARIS, &c., &c.

Dear Sir,

The great and numerous advantages which I experienced in my professional studies while under your kind auspices, ha~~s~~ve induced me to dedicate to you the following little Essay on the Spleen, hoping that the subjects therein discussed, will incite to inquiry on this interesting and important topic.

I have the honour to be,

Dear Sir,

Your most obedient

and obliged Servant,

WILLIAM DOBSON.

14, Arabella Row, Pimlico,
15th July, 1830.

INTRODUCTION.

BEING about to submit to the attention of the public a Physiological Essay, on a subject, the elucidation of which has hitherto baffled the endeavours of the most eminent philosophers, I should feel some introductory apology requisite, were it not that the complaint is general, that our knowledge of the Function of the Spleen is still very partial.

Theories have been promulgated, some of them having a degree of plausibility, others totally unfounded either in fact or analogy. Truth is only to be obtained by patient investigation, such I have endeavoured to exert, and my reward will be complete, if thereby the relation of the Spleen to the other parts of the animal fabric, be in any degree, more clearly developed.

The principal remarks on the *pathology* of the Spleen, are to be found in various medical authors; a few, however, I have added as explanatory of the *agency* of this viscus in disease, and the *mode* in which it exerts its agency. But the primary use, which *I assign to this organ, is perfectly original.*

AN

EXPERIMENTAL INQUIRY,

&c.

HISTORY.

THE ancients were acquainted with the Spleen; they examined this organ, and found it to contain a dark coloured fluid, apparently resembling the Bile, except in the blackness of its colour. This fluid they called "*atra bilis*;" and the use of the spleen they considered to be for the secretion of black bile. It would fill our pages too much to notice every theory that has been offered in each succeeding age, yet, allusion may be made to a few of the most prevalent, or those which are considered by high authorities as the more rational explanations of the physiology of this organ.

An idea was formerly entertained that the spleen was a *glandular* organ; the attention of Anatomists and Physiologists was consequently directed to search for an excretory duct; which, though sought with the greatest diligence, remains still unfound. A variety of vague hypotheses and conjectures were advanced, quite unworthy of notice. However, as the opinions of Dr. Haighton and Sir E. Home are generally esteemed as the most plausible, and by many are fully accredited, these, and a few others may be noticed.

Dr. Haighton, finding the spleen diminished in

size during a meal, considered that the distended stomach presses on the spleen, thereby determining a greater quantity of blood to the stomach, liver, and pancreas, during the digestive process.

Sir E. Home's researches led him to conclude that the spleen consists of a congeries of blood-vessels and absorbents, without any connecting cellular membrane. From this mechanism Sir E. considers the *interstices of the vessels* to be a reservoir for the superabundant serum, lymph globules, soluble mucus, and colouring matter, carried into the circulation immediately after the process of digestion is completed.

Sir Astley Cooper inferred from his own investigations, that the spleen is an elastic reservoir and manufactory of venous blood.

Mr. Hewson thought, that the red globules of the blood were elaborated in this organ.

To Sir Anthony Carlisle's opinion I may briefly advert. "I regard," says this writer, "the compensating heat of the Spleen to be the natural provision against the *torporizing* influence of low temperature suddenly applied to the nervous and muscular structures of the stomach."

Mr. C. Bell regards the spleen as a provision for giving the vessels of the stomach an occasional power and greater activity; enabling them to pour out a quantity of fluid according to the necessity of digestion. And, in addition, he considers the venous blood of the spleen is useful in aiding the function of the liver.

When we consider that these theories of the spleen are those of some of the most zealous cultivators of physiology, we are obliged to confess, that the *structure* of this organ is as yet as little understood as its *function*, and that nothing is decisively known of either. However much respect the Essayist may be disposed to pay to the opinions of these eminent philosophers, he is unable to coincide with their conclusions on the physiology of the spleen: these conclusions being founded on isolated facts, a mode of proceeding destructive to the progress of physiology. The living body must be viewed as constituted of an assemblage of organs, and each organ as destined for the performance of a special action, and, by the aggregate operation, the machine to be rendered perfect; and however diversified the phenomena which each produces, all are assisting in the accomplishment of this perfection. To check a single action in a part of a machine, would either suppress the operation of the whole, or materially impede it; consequently in such a complication of delicate machinery as the animal body, it must be obvious, that were we to remove from it so large a portion as the spleen, imperfeet action would necessarily result. No one part of the animal frame is independent of other parts. No one organ can perform its action when isolated from other organs. It is only by a mutual concurrence, by the co-operation of all, that a proper harmony can result. Impressed with these views, and observing that the physiology of so large a viscus

as the spleen was entirely unknown; that its influence or subserviency in the animal economy to any particular operation, was, by some even questioned, I felt anxious to investigate its function experimentally, conceiving that so large an organ would not have been created in vain. For is it probable, that an organ so extremely vascular,—an organ supplied with so large an artery, and consequently having a large quantity of blood conveyed to it, should be without some important office to fulfil? Had it been placed in the abdomen as a sinecure, or as a cushion to fill up the body, or to counterbalance the ponderous liver, its vascularity would not have been so pre-eminent. The circumstance which led me at last to undertake this inquiry was quite accidental. When experimenting on animals for the purpose of ascertaining the effects which different poisons produce on the animal economy, I was often struck with remarkable variations in the size of the spleen; and on paying further attention to this incident, I observed, that the spleen of a dog, killed a few hours after taking food, was of a very large size when compared to the spleen of a dog that had fasted for several hours. On examining the different theories on this obscure and singular organ, I met with one remark which coincided, to a certain extent, with my own observation; that "the spleen is of a large size when the stomach is empty, and small when the stomach is full." Desirous of obtaining something more specific relative to this organ, I resolved to perform a series of experiments. Biassed, I hope,

by no preconceived idea, I commenced these experiments, determined to note every alteration carefully, and from a collection of facts, to deduce what inferences they would afford. The only way to investigate the works of nature is, by a patient attention to her phenomena, and, whenever any discrepancies occur in the results, to repeat the experiments until the truth appears; and, and at the same time not to rest satisfied with inductive reasoning fromassumed data, so common in science, and so often fallacious: but to proceed as far as possible in unravelling the nature of living actions according to the methods most decisive—*demonstration* and *analogy*.

After attentively perusing the various physiological authors, and finding no other coincidence, except the one alluded to, or any remarkable fact, I instituted the following experiments.

EXPERIMENTAL INVESTIGATION.

The first point of enquiry was to ascertain, as accurately as possible, the changes produced on the spleen by the digestive process, and to ascertain the precise period at which any alteration should be manifest. With these objects in view, the following experiments were performed.

Exp. I. I gave to a middle sized dog a hearty meal of beef and mutton; the animal ate heartily. *In four hours after*, I opened the abdomen, and exposed the spleen immediately: it was *large* and *firm*; its veins appeared completely gorged with blood; on cutting into the organ, a large quantity of dark

coloured blood flowed out: the exact amount could not be estimated; but I should suppose there was about four ounces: it concreted *in a very short time.* The coagulated mass, however, was *soft,* easily broken down, and presented more the appearance termed *grumous blood,* than the proper sanguineous fluid.

EXP. II. A dog was procured as near in size as the one in the last experiment as could be met with; the animal took a full meal of beef and mutton; in five hours *after,* the abdomen was opened; the spleen was very *large and turgid,* with blood. The appearance of the blood was very similar to that in the last experiment; the quantity, however, was *much greater.*

EXP. III. The spleen of a dog (of an equal size to the preceding) was examined twelve hours after any food had been taken; a very remarkable difference was observable; it was *very small,* and *flabby,* and contained only a *very small quantity of blood.* The appearance of the blood differed little from that in the preceding experiments; I thought it not quite so dark.

To ascertain the comparative bulk of the spleen in dogs, I procured two of equal size, and examined their spleens at the same period after a meal; the difference in size was so trifling, as not to invalidate in the least the conclusions I intend to draw from the preceding statements.

Not wishing, however, to rely implicitly on these experiments, for fear that some accidental circum-

stance might have influenced the appearances, I repeated them, but found the results to be precisely similar. Other experiments also were performed at various periods *during* the digestive process and *after* its completion; the size of the spleen was invariably found to be in a ratio to the quantity of nutriment taken into the system, and to the period at which it was examined after the animal had eaten, that is to three hours after a meal, little alteration in this organ was perceptible; but in four hours after, it was large; and in about *five hours* appeared to arrive at its maximum, and then gradually to decrease in bulk for twelve hours, which was as far as I observed its condition.

My next experiments were to remove the spleen from dogs, and to observe any effect which might be produced in the system.

Exp. I. The spleen of a dog was removed;—the animal apparently suffered little from the operation. On the following day I gave it a quantity of food; it ate voraciously; for three hours after no perceptible alteration was produced; but in *four hours after*, indications of uneasiness were shown; the animal became restless, and lastly sunk into a nearly torpid state; it was often moaning, the pupils were dilated,—the heart labouring; there was frequent micturition; the respiration was exceedingly laborious, and, in short, there was every mark of plethora, or over-fulness of the vascular system. In the course of two hours from this period, the animal began to recover; and in about three hours these

symptoms had subsided, considerable langour remained. The animal took a large meal twice or thrice in twenty-four hours, and after each. precisely similar effects were presented. The animal became more feeble daily,—in a month after the operation, it died.

Exp. II. I next removed the spleen from another dog, but instead of giving full meals, as in the last experiment, I gave a small quantity of food every hour, or every two hours. The animal ate voraciously ; no unpleasant symptoms occurred,—this plan was pursued for three weeks, when the animal to all appearacne was quite well ; in fact, it became fat ; the ligature from the splenic artery had come away, and the wound in the abdomen healed. I then commenced giving full meals twice in twenty-four hours, the same train of symptoms followed each meal, and at the same period, as in the last experiment, though perhaps not so urgent : the animal died in a month from the commencement of this plan of feeding.

In both dogs I observed that the intestinal evacuations were of a *lighter* colour than natural. On examining the body of each after death, a small quantity of limpid serum was contained in the bag of the Tunica Arachnoides, and more than a natural quantity in the lateral ventricles ; the veins of the brain were in a highly congested state ; the abdominal viscera presented no unnatural appearances, but the portal system of veins was much gorged with blood. The deductions to be derived from these

experiments, and from the former ones seem sufficiently obvious; but previous to making them, it may be requisite to refer in a succinct manner to a few circumstances connected with the digestive and circulatory systems, so far as they may bear on this question.

PHYSIOLOGICAL VIEWS ON THE DIGESTIVE AND THE CIRCULATING SYSTEMS.

The following physiological statements will assist in calling to mind the principal points in these systems, and thereby it will be more easy to show the associated action of the spleen with other parts of the frame, and will enable us more readily to appreciate any influence which this organ may exert, either on the stomach during digestion, or on the liver in the secretion of bile, during the chylifactive process. The spleen, it will be remembered, has generally been conceived to exert some agency on these organs, and if so, the detail given will enable us to ascertain the precise period of influence, as near as may be, the mode of influence, and the nature of the modifying influences.

Under the phrase "*digestive system,*" are comprised the receiving of food into the stomach, the changes which it undergoes in that viscus, its conversion into chyle; and lastly, the conveyance of that fluid into the circulation: these various processes being designated by the terms, Deglutition, Chymification, Chylification, and Absorption; the last three may be briefly examined. The changes which food

ungergoes in the stomach we need not dwell on, our object at the present is to ascertain the length of time which different kinds of aliment remain in that viscus before they pass into the intestines. The duration of the chymifactive process must be modified by a variety of circumstances; in the first place, the chymifactive period will vary in different individuals, depending on the general power or activity of the system; secondly, it will vary with the quality of the substances taken; and thirdly, according to the state of the individual after he has eaten, whether he remains in repose, or takes exercise. Experiments on dogs show that ligamentous and tendinous structures require to remain a much longer time in the stomach before their solution is effected, than those of an albuminous or gelatinous nature. However, it appears to be nearly established by careful and repeated experiments on animals, that muscle three hours after having been received into the stomach, has passed into the duodenum in the chymous form.

Tendons and ligaments are not dissolved in less than five hours; Gelatine, on account of its soft consistency, becomes chymified in a shorter time: hence, we may assert, that a meal of common animal food (under ordinary circumstances) will in three hours and a half have passed into the intestines—dogs are referred to as the subjects of experiment. Digestion of the food is said to commence immediately it arrives in the stomach, yet little or no chyme passes into the duodenum until an hour or an hour and a half after. The chyme on arriving in the intestines

undergoes a separation; the nutritive part, or the chyle, covers the walls of the bowels, while the excrementitious portion passes forwards; this process, termed the "*Chylifactive*," is certainly the most curious and important in the whole series. The agents which effect this change are unknown; this only is known, that the chyme becomes assimilated in the duodenum, with the biliary and pancreatic fluids, and soon after assumes this particular state. The next process which the food undergoes is the "*Absorptive*," or the conveyance of its nutritive parts into the circulation. Majendie states that the process of absorption occasionally does not commence until three or four hours after a meal. On this subject I have made a few observations, the following are the results. A dog having eaten a quantity of beef and mutton, was killed an hour after with Prussic Acid; that portion of meat only *in contact with the walls of the stomach* was reduced to a pulpy state; a small quantity of slimy fluid was contained in the duodenum; a few lacteal vessels only were circulating chyle, probably not more than if no food had been taken. In another dog, killed under similar circumstances to the last, but in two hours after eating, there was a small quantity of chyme in the duodenum, and of chyle in the lacteals. In a third dog, killed three hours after a meal, a considerable part of the food had passed into the intestines; the lacteals contained a large quantity of chyle. In a fourth dog, killed four hours after a meal, the stomach was nearly empty,

containing no solid substance; the coats of the duodenum and jejunum were covered with chyle, and the absorbing vessels were actively employed in conveying the chyle into the circulation; in five hours after a meal the digestive process seemed nearly completed, the lacteal vessels and thoracic duct containing only a small quantity of chyle.

The "*circulatory system*" next comes under examination in regard to its principal points. The blood whilst circulating is to be viewed as an homogeneous and vital fluid, distributed to every part of the body, affording life, heat, and nourishment wherever it circulates, being acted upon by various structures,—these, separating substances from it, both for the purpose of excretion, and also for the performance of ulterior offices in the economy, each part of the body in health receiving a quantity corresponding to its importance in the frame, from the brain the most vital, to the bones the lowest in the scale, the blood itself circulating in vessels of various kinds, adapted by their physical properties and mechanical construction for fulfilling their appointed offices. The quantity of blood in the *human* body has been variously estimated; any accurate calculation seems to be totally impossible.

The arteries, which convey the blood to every part of the frame, are dense, elastic tubes. The veins, which return the unexpended blood, are less firm than the arteries; the arteries are supposed to contain one fourth of the mass of blood; the veins the other three-fourths. The relation of the capacity of

the vessels to the volume of blood is an interesting subject for inquiry. In reference to this point, the question that suggests itself, is, Will the vessels permit of dilatation beyond their original state so as to form a reservoir for an *increase in the quantity of blood* as *after digestion*? With respect to the arteries, I think, we may reply decidedly in the negative. The veins are obviously dilatable, though the contrary was asserted by Bichat. It must be admitted that this property is very limited; the veins of the viscera are more elastic than those on the exterior of the body; but any considerable enlargement of these vessels would be incompatible with the healthy functions of the organs. Are the portal veins adapted for fulfilling the office of a reservoir? It would seem not, for though very elastic, they do not possess a *capability to the extent required.* By this it is meant, that since in the process of digestion the quantity of blood so much augments the mass of circulating fluid, that these veins could not, by their utmost extension, receive the same.

Majendie states, that on opening the Thoracic Duct during digestion, half an ounce of chyle flowed out in the first five minutes.

ON THE STRUCTURE OF THE SPLEEN.

Some apparatus attached to the circulation to act as a reservoir after digestion appears from the preceding view absolutely requisite. Where are we to search for so essential an organ? Let us examine the

nature of the spleen, and ascertain whether its physical aptitude fits it to act as a reservoir for the reception of blood. We need not enter into detail respecting the situation, form, and boundaries of this organ, these circumstances being familiar to all. It will be sufficient to remark, that the surrounding structures are soft and easily compressed, so as to allow the spleen to expand in many directions. The spleen is partially and loosely covered by peritoneum; besides this, it has another covering, its proper envelope, the texture of which is laminated, and possesses a *high degree of elasticity*, so much so, as to allow the organ to be inflated by a slight force with air, and on removing the air it resumes its former magnitude. I have observed the *tunic of this viscus to contract and become corrugated when the splenic vein or the vena porta was opened.* The splenic artery is a large division of the cœliac; after its origin it passes over the left crus of the diaphragm,—gives off two or three branches (the "vasa brevia") to the cardiac end of the stomach, and often divides before it permeates the spleen. After its entrance, it subdivides and ramifies throughout the substance of the organ, and as far as I have been able to ascertain, from the extreme branches of the arteries the veins commence *directly*, and *not by the medium of cells,* as generally supposed. The appearance of cells which is produced when the spleen has been inflated and dried, is, in my opinion, nothing more *than the veins*; the calibre having been maintained by the air thrown in. The relative ca-

pacity of the veins to the arteries is much greater than in other parts of the body; and their elasticity much greater than other veins, as exemplified by inflation.

The absorbents of the spleen are few. Sir E. Home could not detect cellular membrane in this organ. I am obliged to dissent from this celebrated physiologist; that cellular membrane does exist in the spleen, and is the common bond of union between its vessels, is, to me, perfectly evident: the quantity is not so great, and of a much looser texture than is generally found in the body. The splenic nerves are derived from the cœliac plexus.

The structural nature of the spleen, and its physical properties, seem to adapt it most appropriately for *a reservoir to the circulation* of the blood, as formed in such increased quantity during the process of digestion; the "modus operandi" of which, I shall proceed to explain.

COROLLARIES REGARDING THE FUNCTION OF THE SPLEEN.

The first series of my experiments show, that an intimate connexion subsists between the nutritive function and the spleen; this position leads to the inquiries, On what does this relation depend? and, In what manner are they associated? The small size of the spleen, during digestion, has been attributed to a mechanical agency exerted by the distended stomach on this organ; and the enlargement after digestion, or when the stomach is empty, to a re-

moval of this pressure: a reference to the bearings of the spleen will easily prove this idea to be fallacious. The enlargement of the spleen has been attributed by Sir E. Home to a different cause. The conclusions which this physiologist deduced from his experiments are, for the following reasons, inadmissible. He introduced into the stomach of an ass a quantity of fluid coloured with rhubarb, and immediately tied the pyloric extremity of the stomach, thus *obstructing the natural course.* On examining the spleen *two hours after,* he found it much enlarged, and containing a greater quantity of rhubarb than any other viscus; nearly the whole of the fluid was removed from the stomach. This he accounts for by supposing that the fluid and the rhubarb were conveyed *directly* into the spleen from the stomach by the absorbent vessels, as no other medium of communication could be found; but the absorbents, intervening between the spleen and the stomach are too few in number to effect this; and as the common outlet of the stomach was interrupted, there might be a greater quantity of rhubarb in the absorbents of the spleen; and that the fluid should be removed from the stomach, by the absorbing vessels into the circulation, and thus augment the size of the spleen, is also rational. To return again to my own experiments, I draw from them these deductions. *That the spleen acts as a reservoir for containing the additional quantity of blood which the vascular system has received, by means of the nutritive process.* It is evident from the remarks on chylification there is

a greater quantity of blood in the system at *five hours* after a meal than at any other period; and as we have premised, that the blood-vessels are not capable of containing this increase with impunity, I infer, that *the spleen serves as a reservoir to hold this surplus;* because at the time the chylifactive process is at an end the spleen is found distended with blood. Then, as detailed in the third experiment, at twelve hours after a meal, the spleen was small, and contained very little blood: the reason of this phenomenon is obvious; at five hours after a meal, the nutritive process is nearly completed; at five hours after a meal, the spleen arrives at its maximum size: now, as secretion goes on in the various emunctories, there must consequently be a reduction of the circulating mass; and to compensate for this, blood is simultaneously expelled from the spleen, so that in twelve hours the whole is removed; no more circulating through that organ than is necessary for its support.

We have now to examine the second series of experiments. When the spleen was removed from a dog, and *full meals* given to the animal, the effects indicated clearly that a greater quantity of blood had been formed than the vessels were capable of containing, compatible with the free action of the vital organs; but as the fluid became diminished in quantity by the secretary functions, healthy action in these parts was again established. But it was observed, that if a *small quantity of food* was given at a time, though often repeated, no deleterious influence was

exerted; that is, if the increase in the volume of blood was not more than equivalent to what had been previously expended by the secretions, no injurious effects were produced.

I performed two experiments somewhat analogous to those which were made by Majendie.

Exp. I. Ten ounces of blood were injected into the jugular vein of a dog, the abdomen being previously laid open. After the injection had proceeded for a short time, I observed the spleen to increase in size gradually until the whole of the blood was injected. This animal had fasted for ten hours, and previous to the operation the spleen was small.

Exp. II. I opened the jugular vein of a dog five hours after eating, the abdomen being at the same time open,—the spleen was large; as blood flowed from the vein, the spleen very perceptibly diminished in size, until the animal fainted. On grasping this organ at the time, a sensation was felt as if it was muscular, and was compressing out its contents with an active force.—I did not perceive the slightest evidence of diminution of any other viscus.

These experiments corroborate the deductions made from the former ones; they illustrate, in short, the principle which I am endeavouring to establish, that the *circulatory vessels are capable of containing only a certain quantity of blood with impunity, and that when an increase in the volume is produced, as after digestion, the spleen performs the office of a reservoir to receive the surplus*; they show also, that when the fluid contained in the vessels becomes re-

duced in quantity, as from bleeding, the spleen affords a supply, so as to enable the various organs to perform their necessary offices: and further, they afford collateral evidence of the spleen being more elastic than the blood-vessels.

When we find such a change produced in the spleen after a meal of solid food, we naturally inquire the effect of a quantity of fluid. When a man sits down and drinks ten or twelve pints of ale, or two or three bottles of wine, a considerable quantity of fluid must be absorbed into the system; and were there not a reservoir attached to the circulation, injurious consequences would undoubtedly ensue. Though relief in these cases might be obtained in some measure from the secretory organs taking on an increased action, still that would not be sufficient to relieve effectually the vascular system. But so wise is that mechanician, our Creator, that he constructs his machines not only to suit ordinary states, but to sustain them under casual exigencies. I have twice had an opportunity of examining the spleen in men who had been accustomed to take large quantities of ale, &c., and in both, the spleen was much larger than natural. In one of these cases the spleen was enormously enlarged, and gave the idea, on pressing it, of a bladder half filled with oil.

A few remarks may now be made on the splenic blood, and on the portal vessels. I have alluded when detailing the experiments, to the appearance of the blood contained in the spleen. The splenic vein joins the mesenteric and hemorrhoidal to form

the vena porta. The blood which is returned from the abdominal viscera has to pass through the liver before it enters the general circulation.

It would require a long time to detail all the phenomena presented by the portal blood; a few, however, may be mentioned. Its colour is exceedingly dark; concretion occurs quickly after it is drawn, but coagulation is never perfect. On what principle can we explain these phenomena? Are we to refer them to our knowledge of the laws of vitality? Mr. Thackrah * has fully established the fact, that "coagulation commences speedily in proportion to the weakness of the system," or in other words, "to the low degree of vitality." Is there a less quantity of vital fluid in the portal, than in the common mass of blood? Will the physical characters of the portal vessels afford any means of elucidation to enable us to answer this question? The arteries which convey the blood to the abdominal viscera and the veins which return it are exceedingly tortuous: and it is a principle in Hydraulics, that a curved tube will not convey fluids with so great a velocity as a straight one. To explain, satisfactorily, the properties of the portal blood on this principle, would require a long train of reasoning, and moreover, would draw me from my present purpose. It seems to me, however, that "MOTION," (a phenomenon with which every one is familiar, but by none clearly understood) is *the cause* of what is vaguely termed *the vitality of the blood*; and the intensity of this principle, ever in a ratio to the velocity of the fluid.

* Inquiry, p. 34, et seq.

The portal blood may have become contaminated with matters foreign to the system, such as Hydrogen and Carbon, &c., which the liver may separate, and these substances may enter into the formation of bile: this, though conjectural, is somewhat plausible. With respect to the colour of the blood, we know this fact, that when it remains even for a short period without being subjected to the respiratory function, its colour becomes darker; indeed the colour of the blood seems to be in a ratio to the time which it has been from the lungs. In connection herewith, as the splenic blood has its velocity diminished, and consequently is retained from the lungs for a considerable time, may we not find the explanation of the speedy concretion, the imperfect coagulation, and the dark colour, in these circumstances?

The tracing of effects to their true causes in the living body is at all times difficult, and often impracticable. In our examinations of the qualities of living bodies, we cannot obtain their real nature by Analysis and Synthesis, as the Chemist can in reference to inorganic matter; analogy is often our only resource.

PATHOLOGICAL PHENOMENA.

The influence which the spleen exerts over the body in disturbed states has never been duly attended to; a few scattered facts are recorded; some casual remarks being occasionally conjoined. The pathology of this viscus has afforded no direct means of elucidating its function. When the liver or the kid-

nies are disordered, their deranged functions testify: thence we deduce the physiology of the organs. But in reference to the spleen, we have had no tangible data afforded to infer from disease the office of this organ; and its function not being known, no means of detecting the disorders, to which it is subject, have occurred.

The most common change which the spleen undergoes is an *augmentation in its size*, termed "ague-cake;" this state being observed after long and inveterate cases of intermittent fever, more especially if the system has been previously debilitated by intemperance, or the individual be of a scrophulous diathesis. After protracted intermittents, the spleen is often found to weigh from three to five pounds. There are cases on record of this organ weighing from thirty to forty pounds. It has occasionally been found like a mere bag; and during life so much enlarged as to be felt through the abdominal parietes. Opportunities for examining the spleen after intermittents are much more rare at the present day, than formerly, when this malady prevailed to a much greater extent. The explanation of those morbid conditions of this organ is obvious; the spleen receives a surplus of blood every twenty-four hours during the cold stage of the paroxysm, or according to the type of the fever; its vessels and its elastic envelope are extended beyond *their ordinary state of dilatation*, and before they can resume their natural condition another rush of blood comes into them, and so on successively, until their power of contractility is entirely abolished;

enlargement of the organ is the natural consequence, disease is set up, inflammation and its effects ensue, thickening of the covering or a tuberculated state of that membrane; tubercles also are occasionally found disseminated throughout the substance of the organ.

There is an old observation, and one which has been confirmed by modern experience, that Hemorrhage from the nose is often concomitant with obstruction of the spleen.

It requires to be investigated what influence the spleen exerts in the production of dropsical effusions; observations on this point may probably induce us to direct some attention to the agency of this viscus,—more particularly in reference to Anasarca and Ascites.

Hemorrhage from the intestines, though of comparatively rare occurrence, does take place; this may arise from some fault in the intestinal vessels, but I feel disposed, in most cases, to suspect the spleen to be implicated; and the function of this organ being deranged, nature relieves herself by these vessels.

Are Amenorrhœa and Menorrhagia dependent on, or connected with, disordered functions of the spleen?

Pain in the left hypochondrium is a very common complaint amongst females about the commencement of the catamenial epoch: the pain is referred to the precise seat of the spleen, and is often very difficult and tedious to remove.

Splenitis is an affection described by medical authors as rarely occurring. It is stated that relief has been obtained in some cases by vomiting of a dark coloured fluid, very much resembling coffee grounds,

and also, by hemorrhage from the hemorrhoidal vessels.

PRACTICAL CONCLUSIONS.

However accurate our knowledge of the various operations in the body, and of the nature of those aberrations to which each is subject, it would be of of little utility unless we applied that knowledge to the removal of disease and to the preservation of health. Hitherto the office of the spleen has been involved in obscurity; and it must be the opinion of every one who studies the works of nature, that while one link in the chain is not understood, all principles laid down must be received with doubt, and in their application, a casual commixture of error cannot be avoided; for until we are more intimately acquainted with the office of every part of the body and its associated relations in disease, the improvement in Medicine can be but slight.

Every reflecting individual, will, I feel persuaded, accede to the opinion, that the circulatory apparatus is adapted to contain a certain volume of blood; and on the purity, or on a certain state of the blood, combined with *quantity* corresponding to the capacity of the vessels, does this apparatus preserve its integrity and true action: and whenever the blood-vessels receive blood of an impure quality, or in an *undue quantity*, disordered action results. From whatever cause the blood acquires this unhealthy quality, the circulation of it through the vasa vasorum will affect the vessels, and thus, their equilibrium of action being

disturbed, it will readily be conceded, that an additional quantity of fluid will not only act in maintaining that excited state, but augment it.

Ex. gr. If in a case of inflammatory fever, a state of the system already excited, and exciteable, I increase the quantity of blood by ordering fluids to be drunk, What will be the effect? they will be absorbed into the vessels, the vessels must be further excited from *distension,* and the impetus of the whole vascular system necessarily augmented to convey it; and this principle is especially applicable to the spleen. If this organ, as I have endeavoured to prove, be a reservoir for the superabundance of blood in the system, when the spleen is affected with disease of any kind, any addition to the mass of blood must increase inordinate excitement already existing in this organ; and even a healthy organ is likely to suffer when the volume of blood is greatly augmented: that harmony which naturally exists between the contained and containing parts being subverted. This principle will, I am persuaded, be a powerful means, not only in the removal of disease, but in preventing its accession.

The practical inferences I have to offer, as deduced from these statements, are the following:—

I. That the quantity of fluid usually taken into the system at one time, is greater than the apparatus is capable of containing with impunity; and in consequence of this, excited vascular action, with all its train of morbid consequences, is a common effect.

II. That in disorders affecting the spleen, as in

Intermittent Fever, and as well of the whole vascular system, the practice of giving *large quantities of fluid*, is not only unphilosophical, but decidedly injurious.

CONCLUSION.

Such are my endeavours to elucidate the Function of the Spleen. I have advanced the idea, *that the primary use of the spleen is to serve as a reservoir to receive the surplus of blood which is contained* IN THE SYSTEM AFTER DIGESTION; and have briefly adverted to the extension of its influence as a *regulator of the circulation* in various states of disturbance.

In the cold stage of a paroxysm in intermittents, some apparatus attached to the circulation to act as a safety valve for preventing those shocks on the delicate organization of the vital viscera to which they would be exposed, seems absolutely necessary.

Numerous illustrations might be adduced to show the agency of the spleen, and to convince us how necessary an organ it is. Though I admit, under certain restrictions, (*the system not being repleted too much at a time*) that an animal can exist independent of its spleen; yet at the same time, I think I have shown that this organ is really required.

For I conceive without the spleen the utility of our domesticated animals would be greatly diminished, and the existence of man rendered almost intolerable; a constant desire for food would lessen his enjoyments, and his sleeps would necessarily be short and more frequent.

Goyder, Printer, 11, Dartmouth Street, Westminster.